

Facility: Arkansas Nuclear One – Unit 1													Date of Exam: 9/5/2008					
Tier	Group	RO K/A Category Points											SRO-Only Points					
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	Total	A2	G*	Total		
1. Emergency & Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A			3	18	3	3	6	
	2	1	2	2	N/A			1	2	N/A			1	9	2	2	4	
	Tier Totals	4	5	5	N/A			4	5	N/A			4	27	5	5	10	
2. Plant Systems	1	3	2	3	3	2	3	3	2	2	2	3	28	3	2	5		
	2	1	1	1	1	1	1	1	0	1	1	1	10	0	2	1	3	
	Tier Totals	4	3	4	4	3	4	4	2	3	3	4	38	5	3	8		
3. Generic Knowledge and Abilities Categories				1		2		3		4		10		1	2	3	4	7
				2		3		2		3				2	1	2	2	

Note:

- Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
- The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
- Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
- Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
- Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
- Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- * The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.
- On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
- For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

ES-401 401-2		PWR Examination Outline							Form ES-	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)										
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1					X		EA2.03 - Reactor trip breaker position	4.2	1	
000008 Pressurizer Vapor Space Accident / 3				X			AA1.07 - Reseating of code safety and PORV.	4.0	2	
000009 Small Break LOCA / 3		X					EK2.03 - S/Gs	3.0	3	
000011 Large Break LOCA / 3					X		EA2.11 – Conditions for throttling or stopping HPI.	3.9	4	
000015/17 RCP Malfunctions / 4	X						AK1.04 - Basic steady state thermodynamic relationship between RCS loops and S/Gs resulting from unbalanced RCS flow.	2.9	5	
000022 Loss of Rx Coolant Makeup / 2			X				AK3.01 - Adjustment of RCP seal backpressure regulator valve to obtain normal flow.	2.7	6	
000025 Loss of RHR System / 4	X						AK1.01 - Loss of RHRS during all modes of operation.	3.9	7	
000026 Loss of Component Cooling Water / 8							Not selected	n/a	n/a	
000027 Pressurizer Pressure Control System Malfunction / 3					X		AA2.07 - Makeup flow indication. Changed KA to AA2.12 – Pressurizer Level	3.7	8	
000029 ATWS / 1				X			EA1.11 - Manual Opening of the CRD Breakers	3.9	9	
000038 Steam Gen. Tube Rupture / 3			X				EK3.08 – Criteria for securing an RCP	4.1	10	
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4		X					EK2.1 – Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.8	11	
000054 (CE/E06) Loss of Main Feedwater / 4						X	2.2.40 – Ability to apply Technical Specifications for a system	3.4	12	
000055 Station Blackout / 6						X	2.4.45 – Ability to prioritize and interpret the significance of each annunciator or alarm.	4.1	13	
000056 Loss of Off-site Power / 6	X						AK1.04 - Definition of saturation conditions, implication for the systems	3.1	14	
000057 Loss of Vital AC Inst. Bus / 6						X	2.1.28 – Knowledge of the purpose and function of major system components and controls.	4.1	15	
000058 Loss of DC Power / 6			X				AK3.01 - Use of dc control power by ED/Gs	3.4	16	
000062 Loss of Nuclear Svc Water / 4							Not selected	n/a	n/a	
000065 Loss of Instrument Air / 8				X			AA1.02 - Components served by instrument air to minimize drain on system	2.6	17	
W/E04 LOCA Outside Containment / 3							Suppressed	n/a	n/a	

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E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
W/E11 Loss of Emergency Coolant Recirc. / 4							Suppressed	n/a	n/a
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4		X					EK2.02 - Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility	4.2	18
000077 Generator Voltage and Electric Grid Disturbances / 6							Not selected	n/a	n/a
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)						Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000001 Continuous Rod Withdrawal / 1							Not selected	n/a	n/a
000003 Dropped Control Rod / 1							Not selected	n/a	n/a
000005 Inoperable/Stuck Control Rod / 1		X					AK2.01 - Controllers and positioners	2.5	19
000024 Emergency Boration / 1							Not selected	n/a	n/a
000028 Pressurizer Level Malfunction / 2							Not selected	n/a	n/a
000032 Loss of Source Range NI / 7							Not selected	n/a	n/a
000033 Loss of Intermediate Range NI / 7							Not selected	n/a	n/a
000036 (BW/A08) Fuel Handling Accident / 8							2.1.28 – Knowledge of the purpose and function of major system components and controls. Changed to System 076 2.1.31	n/a	n/a
000037 Steam Generator Tube Leak / 3						X	AA2.15 - Magnitude of atmospheric radioactive release if cool-down must be completed using steam dump or atmospheric reliefs Changed to AA2.01 Unusual readings of the monitors; steps needed to verify readings.	3.0	20
000051 Loss of Condenser Vacuum / 4							Not selected	n/a	n/a
000059 Accidental Liquid RadWaste Rel. / 9							AK1.05 - The calculation of offsite doses due to a release from the power plant Changed to System 067 AK1.02	n/a	n/a
000060 Accidental Gaseous Radwaste Rel. / 9							Not selected	n/a	n/a
000061 ARM System Alarms / 7							Not selected	n/a	n/a
000067 Plant Fire On-site / 8	X						AK1.02 – Fire Fighting	3.1	21
000068 (BW/A06) Control Room Evac. / 8				X			AA1.13 – Charging Pump controllers (to maintain Pressurizer level)	4.1	22
000069 (W/E14) Loss of CTMT Integrity / 5							Not selected	n/a	n/a
000074 (W/E06&E07) Inad. Core Cooling / 4							Not selected	n/a	n/a
000076 High Reactor Coolant Activity / 9						X	2.1.31 – Ability to locate control switches, controls, and indications, and to determine they correctly reflect the desired plant lineup.	4.6	23
W/E01 & E02 Rediagnosis & SI Termination / 3							Suppressed	n/a	n/a
W/E13 Steam Generator Over-pressure / 4							Suppressed	n/a	n/a
W/E15 Containment Flooding / 5							Suppressed	n/a	n/a
W/E16 High Containment Radiation / 9							Suppressed	n/a	n/a
BW/A01 Plant Runback / 1							Not selected	n/a	n/a
BW/A02&A03 Loss of NNI-X/Y / 7							Not selected	n/a	n/a
BW/A04 Turbine Trip / 4			X				AK3.2 - Normal, abnormal and emergency operating procedures associated with (Turbine Trip)	3.4	24
BW/A05 Emergency Diesel Actuation / 6							Not selected	n/a	n/a
BW/A07 Flooding / 8						X	AA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	3.3	25
BW/E03 Inadequate Subcooling Margin / 4							Not selected	n/a	n/a
BW/E08; W/E03 LOCA Cooldown - Depress. / 4							Not selected	n/a	n/a
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4		X					EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.7	26

BW/E13&E14 EOP Rules and Enclosures			X				EK3.2- Normal, Abnormal and Emergency Operating Procedures associated with (EOP Rules and EOP Enclosures)	3.2	27
CE/A11; W/E08 RCS Overcooling - PTS / 4							Suppressed	n/a	n/a
CE/A16 Excess RCS Leakage / 2							Suppressed	n/a	n/a
CE/E09 Functional Recovery							Suppressed	n/a	n/a
K/A Category Point Totals:	1	2	2	1	2	1	Group Point Total:	9	

PWR Examination Outline Plant Systems - Tier 2/Group 1 (RO)													Form ES-401-2	
	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
003 Reactor Coolant Pump					X				X			K5.03 - Effects of RCP shutdown on T-ave., including the reason for the unreliability of T-ave. in the shutdown loop Changed to K5.02 – Effects of RCP coastdown on RCS parameters. A3.01 – Seal Injection flow	2.8 3.3	28 29
004 Chemical and Volume Control						X						K6.09 - Purpose of VCT divert valve	2.8	30
005 Residual Heat Removal			X								X	2.2.38 - Knowledge of conditions and limitations in the facility license. K3.01 - RCS	3.6 3.9	31 32
006 Emergency Core Cooling				X								K4.08 - Recirculation flowpath of reactor building sump	3.4 *	33
007 Pressurizer Relief/Quench Tank	X											K1.01 – Containment System	2.9	34
008 Component Cooling Water	X											K1.02 - Loads cooled by CCWS	3.3	35
010 Pressurizer Pressure Control				X								K4.02 - Prevention of uncovering PZR heaters	3.0	36
012 Reactor Protection						X						K6.04 – Bypass block circuits	3.3	37
013 Engineered Safety Features Actuation					X							K5.02 - Safety system logic and reliability	2.9	38
022 Containment Cooling		X										K2.02 - Chillers	2.5	39
025 Ice Condenser												Suppressed	n/a	n/a
026 Containment Spray		X								X		K2.02 - MOVs A4.01 – CSS control	2.7 4.5	40 41
039 Main and Reheat Steam	X									X		K1.06 - Condenser steam dump A4.07 - Steam dump valves	3.1 2.8 *	42 43
059 Main Feedwater							X					A1.07 - Feed Pump speed, including normal control speed for ICS	2.5 *	44
061 Auxiliary/Emergency Feedwater			X						X			K3.02 - S/G A3.02 – RCS Cooldown during AFW operations.	4.2 4.0	45 46
062 AC Electrical Distribution								X				A2.16 - Degraded system voltages	2.5	47

PWR Examination Outline													Form ES-401-	
Plant Systems - Tier 2/Group 1 (RO)														
	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
063 DC Electrical Distribution								X				A2.01 – Grounds 2.2.42 – Ability to recognize system parameters that are entry level condition for Technical Specificationn	2.5 3.4	48 49
064 Emergency Diesel Generator						X						K6.08 – Fuel Oil Storage Tanks	3.2	50
073 Process Radiation Monitoring							X					A1.01 - Radiation levels	3.2	51
076 Service Water				X								K4.01 - Conditions initiating automatic closure of closed cooling water auxiliary building header supply and return valves	2.5 *	52
078 Instrument Air			X								X	K3.01 – Containment Air System Changed KA to K3.02 – Pneumatic Valves and Controls 2.1.32 – Ability to explain and apply system limits and precautions.	3.4 3.8	53 54
103 Containment							X					A1.01 - Containment pressure, temperature, and humidity	3.7	55
K/A Category Point Totals:	3	2	3	3	2	3	3	2	2	2	3	Group Point Total:		28

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 2 (RO)											Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive				X								K4.01 – Rod Position Indication	3.5	56
002 Reactor Coolant												Not selected	n/a	n/a
011 Pressurizer Level Control									X			A3.01 - Boration/dilution	2.8 *	57
014 Rod Position Indication												Not selected	n/a	n/a
015 Nuclear Instrumentation					X							K5.10 – Excore Detector Operation	2.8	58
016 Non-nuclear Instrumentation												Not selected	n/a	n/a
017 In-core Temperature Monitor											X	2.1.27 - Knowledge of system purpose and / or function.	3.9	59
027 Containment Iodine Removal												Not selected	n/a	n/a
028 Hydrogen Recombiner and Purge Control		X										K2.01 – Hydrogen Recombiners	2.5	60
029 Containment Purge												Not selected	n/a	n/a
033 Spent Fuel Pool Cooling												Not selected	n/a	n/a
034 Fuel Handling Equipment	X											K1.05 - Shutdown monitor	2.5 *	61
035 Steam Generator						X						K6.01 - MSIVs	3.2	62
041 Steam Dump/Turbine Bypass Control												Not selected	n/a	n/a
045 Main Turbine Generator			X									K3.01 – Remainder of the plant	2.9	63
055 Condenser Air Removal												Not selected	n/a	n/a
056 Condensate												Not selected	n/a	n/a
068 Liquid Radwaste												Not selected	n/a	n/a
071 Waste Gas Disposal											X	A4.26 – Authorized waste gas release, conducted in compliance with radioactive gas discharge permit	3.1	64
072 Area Radiation Monitoring							X					A1.01 - Radiation levels	3.4	65
075 Circulating Water												Not selected	n/a	n/a
079 Station Air												Not selected	n/a	n/a
086 Fire Protection												Not selected	n/a	n/a
K/A Category Point Totals:	1	1	1	1	1	1	1	0	1	1	1	Group Point Total:		10

Facility: Arkansas Nuclear One – Unit 1		Date of Exam: 9/5/2008				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.21	Ability to obtain and verify controlled procedure copy.	3.5	66		
	2.1.29	Knowledge of how to conduct and verify valve lineups.	4.1	67		
	2.1.					
	2.1.					
	2.1.					
	Subtotal				2	
2. Equipment Control	2.2.15	Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tag-outs, etc.	3.9	68		
	2.2.13	Knowledge of tagging and clearance procedures	4.1	69		
	2.2.36	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.				
	2.2.21	Changed KA to Knowledge of pre- and post-maintenance operability requirements.	2.9	70		
	2.2.					
	2.2.					
	2.2.					
	Subtotal				3	
3. Radiation Control	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions.	3.2	71		
	2.3.13	Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.	3.4	72		
	2.3.					
	2.3.					
	2.3.					
	Subtotal				2	
4. Emergency Procedures / Plan	2.4.11	Knowledge of abnormal condition procedures.	4.0	73		
	2.4.21	Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.	4.0	74		
	2.4.49	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.6	75		
	2.4.					
	2.4.					
	2.4.					
	Subtotal				3	
Tier 3 Point Total				10		

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	027 Pressurizer Pressure Control System Malfunction - AA2.07 Makeup flow indication.	No credible tie for this K/A exists for the System. Replaced with same system - AA2.12 Pressurizer Level.
1/2	036 Fuel Handling Accident - 2.1.28 Knowledge of the purpose and function of major system components and controls.	Could not write a credible question since only RO action is to suspend fuel movement and exit. Randomly selected new system 076 High Reactor Coolant Activity - 2.1.31 Ability to locate control switches, controls, and indications, and to determine they correctly reflect the desired plant lineup.
1/2	037 Steam Generator Tube Leak - AA2.15 Magnitude of atmospheric radioactive release if cool-down must be completed using steam dump or atmospheric reliefs.	No credible CFR 41 RO tie exists for this K/A. Replaced with same system - AA2.01 Unusual readings of the monitors; steps needed to verify readings.
1/2	059 Accidental Liquid Radwaste Release - AK1.05 The calculation of offsite does due to a release from the power plant.	Not possible to prepare a psychometrically sound question related to the subject K/A. Randomly selected new system 067 Plant Fire On-site - KA AK1.02 Fire Fighting.
2/1	003 Reactor Coolant Pump - K5.03 Effects of RCP shutdown on T-ave, including the reason for the unreliability of T-ave, in the shutdown loop.	Posed a double jeopardy with Tier 1 Group 1 015/17 RCP Malfunctions - AK1.04 Basic steady state thermodynamic relationship between RCS loops and S/Gs resulting from unbalanced RCS flow. Randomly selected same system - KA 5.02 Effects of RCP coastdown on RCS parameters.
2/1	078 Instrument Air System (IAS) - K3.01 Containment Air System.	Rejected due to Low Operational value for discriminatory SRO/RO level question. Containment Air system is used for Breathing Air or Tool Service Air and serves no other functions. Randomly selected same system - K3.02 Pneumatic Valves and Controls.
3	Equipment Control - Generic 2.2.36 Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	RO would not perform this function. At ANO normally performed by an SRO. Randomly selected same category - 2.2.21 Knowledge of pre- and post- maintenance operability requirements.

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E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1						X	2.4.2- Knowledge of system setpoints, interlocks and automatic actions associated with EOP entry conditions.	4.6	76
000008 Pressurizer Vapor Space Accident / 3							Not selected	n/a	n/a
000009 Small Break LOCA / 3							Not selected	n/a	n/a
000011 Large Break LOCA / 3							Not selected	n/a	n/a
000015/17 RCP Malfunctions / 4							Not selected	n/a	n/a
000022 Loss of Rx Coolant Makeup / 2							Not selected	n/a	n/a
000025 Loss of RHR System / 4							Not selected	n/a	n/a
000026 Loss of Component Cooling Water / 8							Not selected	n/a	n/a
000027 Pressurizer Pressure Control System Malfunction / 3							Not selected	n/a	n/a
000029 ATWS / 1						X	2.2.39 Knowledge of less than or equal to one hour Technical Specification action statements for systems.	4.5	77
000038 Steam Gen. Tube Rupture / 3							Not selected	n/a	n/a
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4					X		EA2.2 – Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.	4.0	78
000054 (CE/E06) Loss of Main Feedwater / 4							Not selected	n/a	n/a
000055 Station Blackout / 6							Not selected	n/a	n/a
000056 Loss of Off-site Power / 6							Not selected	n/a	n/a
000057 Loss of Vital AC Inst. Bus / 6					X		AA2.16 – Normal and Abnormal Pressurizer Level for various modes of plant operation.	3.1	79
000058 Loss of DC Power / 6							Not selected	n/a	n/a
000062 Loss of Nuclear Svc Water / 4							Not selected	n/a	n/a
000065 Loss of Instrument Air / 8							Not selected	n/a	n/a
W/E04 LOCA Outside Containment / 3							Suppressed	n/a	n/a
W/E11 Loss of Emergency Coolant Recirc. / 4							Suppressed	n/a	n/a
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4						X	2.4.46 – Ability to verify that the alarms are consistent with the plant conditions.	4.2	80
000077 Generator Voltage and Electric Grid Disturbances / 6					X		AA2.03 – Generator current outside the capability curve.	3.6	81
K/A Category Totals:					3	3	Group Point Total:		6

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E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000001 Continuous Rod Withdrawal / 1							Not selected	n/a	n/a	
000003 Dropped Control Rod / 1							Not selected	n/a	n/a	
000005 Inoperable/Stuck Control Rod / 1							Not selected	n/a	n/a	
000024 Emergency Boration / 1							Not selected	n/a	n/a	
000028 Pressurizer Level Malfunction / 2							Not selected	n/a	n/a	
000032 Loss of Source Range NI / 7							Not selected	n/a	n/a	
000033 Loss of Intermediate Range NI / 7							Not selected	n/a	n/a	
000036 (BW/A08) Fuel Handling Accident / 8							Not selected	n/a	n/a	
000037 Steam Generator Tube Leak / 3							Not selected	n/a	n/a	
000051 Loss of Condenser Vacuum / 4						X	2.4.21 – Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.	4.6	82	
000059 Accidental Liquid RadWaste Rel. / 9							Not selected	n/a	n/a	
000060 Accidental Gaseous Radwaste Rel. / 9							Not selected	n/a	n/a	
000061 ARM System Alarms / 7							Not selected	n/a	n/a	
000067 Plant Fire On-site / 8							Not selected	n/a	n/a	
000068 (BW/A06) Control Room Evac. / 8							Not selected	n/a	n/a	
000069 (W/E14) Loss of CTMT Integrity / 5							Not selected	n/a	n/a	
000074 (W/E06&E07) Inad. Core Cooling / 4							Not selected	n/a	n/a	
000076 High Reactor Coolant Activity / 9						X	AA2.02 – Corrective Actions required for High Fission Product Activity in RCS.	3.4	83	
W/E01 & E02 Rediagnosis & SI Termination / 3							Suppressed	n/a	n/a	
W/E13 Steam Generator Over-pressure / 4							Suppressed	n/a	n/a	
W/E15 Containment Flooding / 5							Suppressed	n/a	n/a	
W/E16 High Containment Radiation / 9							Suppressed	n/a	n/a	
BW/A01 Plant Runback / 1							Not selected	n/a	n/a	
BW/A02&A03 Loss of NNI-X/Y / 7							Not selected	n/a	n/a	
BW/A04 Turbine Trip / 4							Not selected	n/a	n/a	
BW/A05 Emergency Diesel Actuation / 6							Not selected	n/a	n/a	
BW/A07 Flooding / 8							Not selected	n/a	n/a	
BW/E03 Inadequate Subcooling Margin / 4						X	EA2.1 – Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	4.0	84	
BW/E08; W/E03 LOCA Cooldown - Depress. / 4							Not selected	n/a	n/a	
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4						X	2.1.7 – Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.7	85	
BW/E13&E14 EOP Rules and Enclosures							Not selected	n/a	n/a	
CE/A11; W/E08 RCS Overcooling - PTS / 4							Suppressed	n/a	n/a	
CE/A16 Excess RCS Leakage / 2							Suppressed	n/a	n/a	
CE/E09 Functional Recovery							Suppressed	n/a	n/a	
K/A Category Point Totals:	0	0	0	0	2	2	Group Point Total:		4	

PWR Examination Outline Plant Systems - Tier 2/Group 1 (SRO)													Form ES-401-2	
	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
003 Reactor Coolant Pump								X				A2.03 – Problems associated with RCP motors, including faulty motors and current, and winding and bearing temperature problems.	3.1	86
004 Chemical and Volume Control												2.4.1 – Knowledge of EOP entry conditions and immediate action steps. Changed to System 006 A2.03	n/a	n/a
005 Residual Heat Removal												Not selected	n/a	n/a
006 Emergency Core Cooling								X				A2.03 – System Leakage	3.7	87
007 Pressurizer Relief/Quench Tank												Not selected	n/a	n/a
008 Component Cooling Water												Not selected	n/a	n/a
010 Pressurizer Pressure Control												Not selected	n/a	n/a
012 Reactor Protection												Not selected	n/a	n/a
013 Engineered Safety Features Actuation											X	2.4.1 – Knowledge of EOP entry conditions and immediate action steps.	4.8	88
022 Containment Cooling												Not selected	n/a	n/a
025 Ice Condenser												Suppressed	n/a	n/a
026 Containment Spray											X	2.4.21- Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc. Changed to 2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry level conditions for emergency and abnormal operating procedures.	4.7	89
039 Main and Reheat Steam												Not selected	n/a	n/a
059 Main Feedwater												Not selected	n/a	n/a
061 Auxiliary/Emergency Feedwater								X				A2.02 – Loss of air to steam supply valve Changed to A2.03 Loss of DC Power	3.4	90
062 AC Electrical Distribution												Not selected	n/a	n/a
063 DC Electrical Distribution												Not selected	n/a	n/a
064 Emergency Diesel Generator												Not selected	n/a	n/a
073 Process Radiation Monitoring												Not selected	n/a	n/a
076 Service Water												Not selected	n/a	n/a
078 Instrument Air												Not selected	n/a	n/a
103 Containment												Not selected	n/a	n/a
K/A Category Point Totals:	0	0	0	0	0	0	0	3	0	0	2	Group Point Total:		5

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 2 (SRO)											Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive												Not selected	n/a	n/a
002 Reactor Coolant												Not selected	n/a	n/a
011 Pressurizer Level Control								X				A2.12 – Operation of Auxiliary Spray	3.3	91
014 Rod Position Indication												Not selected	n/a	n/a
015 Nuclear Instrumentation										X		2.2.39 – Knowledge of less than or equal to one hour Technical Specification action statements for systems.	4.5	92
016 Non-nuclear Instrumentation								X				A2.01 – Detector Failure.	3.1	93
017 In-core Temperature Monitor												Not selected	n/a	n/a
027 Containment Iodine Removal												Not selected	n/a	n/a
028 Hydrogen Recombiner and Purge Control												Not selected	n/a	n/a
029 Containment Purge												Not selected	n/a	n/a
033 Spent Fuel Pool Cooling												Not selected	n/a	n/a
034 Fuel Handling Equipment												Not selected	n/a	n/a
035 Steam Generator												Not selected	n/a	n/a
041 Steam Dump/Turbine Bypass Control												Not selected	n/a	n/a
045 Main Turbine Generator												Not selected	n/a	n/a
055 Condenser Air Removal												Not selected	n/a	n/a
056 Condensate												Not selected	n/a	n/a
068 Liquid Radwaste												Not selected	n/a	n/a
071 Waste Gas Disposal												Not selected	n/a	n/a
072 Area Radiation Monitoring												Not selected	n/a	n/a
075 Circulating Water												Not selected	n/a	n/a
079 Station Air												Not selected	n/a	n/a
086 Fire Protection												Not selected	n/a	n/a
K/A Category Point Totals:	0	0	0	0	0	0	0	2	0	0	1	Group Point Total:		3

Facility: ANO Unit 1		Date of Exam: 9/5/2008				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.5	Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.			3.9	94
	2.1.35	Knowledge of the fuel-handling responsibilities of SROs.			3.9	95
	Subtotal					2
2. Equipment Control	2.2.19	Knowledge of maintenance work order requirements.			3.4	96
	Subtotal					1
3. Radiation Control	2.3.5	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personal monitoring equipment, etc.				
	2.3.4	Changed KA to: Knowledge of radiation exposure limits under normal or emergency conditions.			3.7	97
	2.3.11	Ability to control radiation releases			4.3	98
	Subtotal					2
4. Emergency Procedures / Plan	2.4.8	Knowledge of how abnormal operating procedures are used in conjunction with EOPs.			4.5	99
	2.4.35	Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.			4.0	100
	Subtotal					2
Tier 3 Point Total						7

Tier / Group	Randomly Selected K/A	Reason for Rejection
2/1	004 Chemical and Volume Control - 2.4.1 Knowledge of EOP entry conditions and immediate action steps.	Two of the five questions in tier 2 group 1 were KA 2.4.1. Felt the group was oversampled. Randomly selected new system 006 Emergency Core Cooling - A2.03 System Leakage.
2/1	026 Containment Spray -2.4.21 Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.	Due to the simplicity of the system, no credible distracters could be written for this system. Randomly selected same system - 2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry level conditions for emergency and abnormal operating procedures.
2/1	061 Auxiliary / Emergency Feedwater - A2.02 Loss of air to steam supply valve.	KA does not apply to ANO Unit 1. Additionally suppressed A2.02, 2.06, 2.07, 2.08 as they do not apply. Randomly selected same system - A2.03 Loss of DC Power.
3	3 Radiation Control – 2.3.5 Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	No credible CFR 43 SRO tie. Randomly selected – 2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions.

Facility: <u>ANO-1</u>		Date of Examination: <u>9-8-2008</u>
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: <u>2008-1</u>
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
A1. Conduct of Operations 2.1.29 (Imp 4.1)	N/R	Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc. A1JPM-RO-LINE1
A2. Conduct of Operations 2.1.19 (Imp 3.9)	N/S	Ability to use plant computers to evaluate system or component status. A1JPM-RO-PMS3
A3. Equipment Control 2.2.12 (Imp 3.7)	D/R	Knowledge of surveillance procedures. A1JPM-RO-SURV3
A4. Radiation Control 2.3.4 (Imp 3.2)	M/R	Knowledge of radiation exposure limits under normal or emergency conditions. A1JPM-RO-DOSE-SVY2
A5. Emergency Procedures/Plan	N/A	N/A
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.		
* Type Codes & Criteria: (C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1 ; randomly selected)		

Facility: <u>ANO-1</u>		Date of Examination: <u>9-8-2008</u>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>		Operating Test Number: <u>2008-1</u>
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
A5. 2.1.23 (Imp 4.3)	D/R	Ability to perform specific system and integrated plant procedures during all modes of plant operation. A1JPM-SRO-HTBAL1
A6. 2.1.34 (Imp 3.5)	M/R	Knowledge of primary and secondary plant chemistry limits. A1JPM-SRO-CHEM1
A7. 2.2.12 (Imp 4.1)	D/R	Knowledge of surveillance procedures. A1JPM-SRO-SURV4
A4. 2.3.4 (Imp 3.7)	N/R	Knowledge of radiation exposure limits under normal or emergency conditions. A1JPM-SRO-DOSE-SVY2
A8. Emergency Procedures/Plan 2.4.41 (Imp 4.6)	N/S	Knowledge of the Emergency Action Level thresholds and classification A1JPM-SRO-EAL11
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.		
* Type Codes & Criteria: (C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1 ; randomly selected)		

Facility: <u>ANO-1</u>		Date of Examination: <u>9-8-2008</u>
Exam Level: RO <input checked="" type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test No.: <u>2008-1</u>
Control Room Systems® (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)		
System / JPM Title	Type Code*	Safety Function
C1. A1JPM-RO-HYD01, Place Hydrogen Recombiner M-55A in operation 028 A4.01 (RO 4.0/SRO 4.0)	D/EN/P/S	5 Containment Integrity
S1. A1JPM-RO-CRD03 Transfer a Group of Rods to the Auxiliary Power Supply 003 AA2.01 (RO 3.7/SRO 3.9)	A/D/S	1 Reactivity Control
S2. A1JPM-RO-MUP01 Isolate Letdown, Restore Makeup and Seal Injection 004 A4.06 (RO 3.6/SRO 3.1)	D/E/L/S	2 Reactor Coolant System Inventory Control
S3. A1JPM-RO-PZR05 CONTROL RCS PRESSURE RESPOND TO LOW RCS PRESSURE 010 A3.02 (RO 3.6/SRO 3.5)	N/A/S	3 Reactor Pressure Control
S4. A1JPM-RO-DHR03 Establish Decay Heat Removal Using P-34A 005 A4.01 (RO 3.6/SRO 3.4)	A/D/L/S	4 Heat Removal From Reactor Core (Primary)
S5. A1JPM-RO-EDG04 Emergency Diesel Generator (EDG) System 064 A4.07 (RO 3.4/SRO 3.4)	A/D/EN/S	6 Electrical
S6. A1-JPM-RO-RPS05 Place Channel "A" in a Tripped Condition BW E02.EA1.1 (RO 4.0/SRO 3.6)	D/E/S	7 Instrumentation

S7.	A1-JPM-RO-SW003 Service Water and Auxiliary Cooling Water System 076 A2.01 (RO 3.5/SRO 3.7)	A/D/E/S	8 Plant Service Systems
In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)			
P1.	A1JPM-RO-EFW03 Relieve steam binding of an Emergency Feedwater Pump 061 K5.05 (RO 2.7/SRO 3.2)	D/E/R/EN	4 Heat Removal From Reactor Core (Secondary)
P2.	A1JPM-RO-RPS06 Remove Power from CRD System Due to "D" RPS channel trip relay failure. 012 A2.06 (RO 4.4/SRO 4.7)	N	7 Instrumentation
P3.	ANO-1-JPM-RO-GRW01, Waste Gas Decay Tank release 071 A4.26 (RO 3.1/SRO 3.9)	D/P/R	9 Radioactivity Release
<p>[@] All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.</p>			
* Type Codes		Criteria for RO / SRO-I / SRO-U	
(A)lternate path		4-6 / 4-6 / 2-3	
(C)ontrol room		≤ 9 / ≤ 8 / ≤ 4	
(D)irect from bank		≥ 1 / ≥ 1 / ≥ 1	
(E)mergency or abnormal in-plant		- / - / ≥ 1 (control room system)	
(EN)gineered safety feature		≥ 1 / ≥ 1 / ≥ 1	
(L)ow-Power / Shutdown		≥ 2 / ≥ 2 / ≥ 1	
(N)ew or (M)odified from bank including 1(A)		≤ 3 / ≤ 3 / ≤ 2 (randomly selected)	
(P)revious 2 exams		≥ 1 / ≥ 1 / ≥ 1	
(R)CA			
(S)imulator			

Facility: <u>ANO Unit 1</u>		Date of Examination: <u>9/5/2008</u>
Exam Level: RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/>		Operating Test No.: <u>2008-1</u>
Control Room Systems [@] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)		
System / JPM Title	Type Code*	Safety Function
S3. A1JPM-RO-PZR05 CONTROL RCS PRESSURE IN RESPOND TO LOW RCS PRESSURE 010 A3.02 (RO 3.6/SRO 3.5)	N/A/S	3 Reactor Pressure Control
S4. A1JPM-RO-DHR03 Establish Decay Heat Removal Using P-34A 005 A4.01 (RO 3.6/SRO 3.4)	A/D/L/S	4 Heat Removal From Reactor Core (Primary)
S5. A1JPM-RO-EDG04 Emergency Diesel Generator (EDG) System 064 A4.07 (RO 3.4/SRO 3.4)	A/D/EN/S	6 Electrical
In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
P1. A1JPM-RO-EFW03 Relieve steam binding of an Emergency Feedwater Pump 061 K5.05 (RO 2.7/SRO 3.2)	D/E/R/EN	4 Heat Removal From Reactor Core (Secondary)
P2. A1JPM-RO-RPS06 Remove Power from CRD System Due to "D" RPS channel trip relay failure. 012 A2.06 (RO 4.4/SRO 4.7)	N	7 Instrumentation
@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.		
* Type Codes	Criteria for RO / SRO-I / SRO-U	

Facility: ANO-1	Scenario No.: 1-R5	Op-Test No.: 2008-1	
Examiners: _____	Operators: _____	_____	
_____	_____	_____	
_____	_____	_____	
Initial Conditions:			
90% power due to dispatcher direction for loss of 500KV.			
C2A IA compressor is out of service for overhaul.			
ULD is failed and will not lower power.			
RPS is failed and will not initiate a RX trip.			
Provide stop watch for surveillance.			
Two rods will fail to insert on the RX trip.			
Turnover:			
Day shift normal working day.			
90% power due to dispatcher direction for loss of 500KV line as a result of storm damage to the Mabelvale 500KV line. No storms are currently in the area.			
C2A IA compressor is out of service for overhaul.			
1104.005 Supplement 2 RB Spray Red Train Valves Quarterly Test is in progress complete through step 2.2.2. This is not the 18 month surveillance.			
Crew will continue in surveillance after turnover.			
Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (SRO, BOP)	Perform 1104.005 Supplement 2 RB Spray Red Train Valves Quarterly Test
2	DI_ICC0009L	N (SRO) R (ATC)	Dispatcher directs power reduction to 700Mwe ULD is failed
3	AI_FIC1207	I (SRO, ATC)	RCP total flow setpoint fails to high
4	CV016	C (SRO, BOP)	RCP seal failure
5	DI_ICC0009L	N (SRO) R (ATC)	Power reduction ULD is failed
6	DI_H24T	M (ALL)	Loss of H2 bus
	CO_P32A	N/A	If power <55%, Trip 'A' RCP when H2 bus is lost (Contingency to ensure RPS trip setpoint is reached.)
7	RP246,7,8,9	C (SRO, ATC)	RPS is failed Manual RX trip (TS) (ATC-CT)

CONTINUED

Event No.	Malf. No.	Event Type*	Event Description
8	RD362 RD363	C (SRO, ATC)	Stuck rod (TS) Stuck rod (ATC-CT)
9	CV020 RC006 ES259 CV-1300	M (ALL) C (BOP)	'B' RCP seal failure ~700gpm RCS leak (TS) (BOP-CT) ESAS Channel 1 fails to actuate (TS) (ATC-CT) CV1300 Fails open
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

SCENARIO #1-R5 NARRATIVE

The crew will assume the watch at 90% power. The Mabelvale 500KV line is out of service due to storm related damage in south east Arkansas. The down power was completed 4 hours ago. Reactor engineering has directed that rods can be used to account for the xenon transient.

1104.005 Supplement 2 RB Spray Red Train Valves Quarterly Test is complete through step 2.2.2. The crew should brief the remaining steps of the surveillance. The BOP will perform the stroke test **(BOP-N) (SRO-N)**.

The dispatcher will call and direct U1 power be reduced to ~700Mwe in the next 10 minutes. The CRS should calculate the required rate and direct power reduction per 1203.045 Rapid Plant Shutdown. The ATC should recognize that the ULD is not responding and power is not lowering. The ATC should reduce power to ~700 Mwe using the SG/RX Master station in hand. **(ATC-R) (SRO-N)**

The controlling RCP total seal injection flow setpoint will fail high. **(ATC-I) (SRO-I)**. This will cause CV-1207 RCP Seal Injection Control Valve to fail open raising total seal injection flow to maximum. Annunciator K08-D7 RCP Seal Cavity Press HI/LO will alarm due to the high seal injection flow. The CRS should reference 1203.012G K08 Annunciator Corrective Action. The ACA will direct the CRS to 1203.031 Reactor Coolant Pump and Motor Emergency. The crew should recognize high seal injection flow on C04 and take manual control of CV-1207 to establish 8-10gpm individual seal injection flow.

The RCP seal injection transient will cause the 'B' RCP lower seal to fail **(BOP-C) (SRO-C)**. The CRS should implement 1203.031 Reactor Coolant Pump and Motor Emergency and reduce power to ~60% in order to stop the 'B' RCP using 1103.006 **(ATC-R) (SRO-N)** The ATC should reduce power to ~60% using the SG/RX Master station in hand.

At ~65% power or as directed by the lead evaluator a loss of the H2 bus will occur resulting in a loss of two RCP's (B and D) **(BOP-M) (SRO-M) (ATC-M)**. If reactor power is <55% then the 'A' RCP will be tripped along with the H2 bus by the simulator instructor to create the condition for the recognition of an RPS failure. The ATC should recognize the reactor should have tripped and manually trip the reactor.

(ATC-C) (SRO-C) (ATC-CT) (TS).

TS 3.3.1 Condition C

CT criteria - The reactor should be manually tripped within 2 minutes of the loss of the H2 bus.

Two control rods will fail to fully insert on the Rx trip. **(SRO-C) (ATC-C)** The ATC should recognize and report this condition during the immediate action report. The CRS will direct 1202.012, RT-12 Emergency Boration to be performed. **(ATC-CT)**

TS 3.1.4 Condition C

CT criteria – Emergency boration should be started within 5 minutes of the RX trip.

CONTINUED

SCENARIO #1-R5 NARRATIVE CONTINUED

~10 minutes post trip a ~700gpm leak will occur in the reactor building from the failed RCP seal **(ALL-M) (TS)**. Subcooling margin will be lost requiring the BOP to trip all running RCP's within 2 minutes. **(BOP-CT)** All ESAS channels will auto actuate except ES Ch.1. The crew should recognize the leak and recognize ES Ch. 1 failed to actuate. The ATC should manually actuate ES Ch.1 from C04 **(ATC-CT)**. CV-1300 on ES Ch.2 fails to close. The BOP should recognize the open valve and attempt to close it manually. The CRS will direct operation per either 1202.002 Loss of Subcooling Margin or 1202.010 ESAS. Either procedure is acceptable. If the CRS enters ESAS he will eventually be directed to 1202.002 Loss of Subcooling Margin.

TS 3.4.13 Condition A

CT-Criteria RCP' should be tripped within 2 minutes of the loss of SCM.

CT criteria - ESAS Ch. 1 should be manually actuated before RT-10 is reported complete.

Facility: ANO-1

Scenario No.: 2-R5

Op-Test No.: 2008-1

Examiners: _____ Operators: _____

Initial Conditions:

100% Power

EFIC is failed and will not auto actuate.

C2A IA compressor is out of service for overhaul.

Provide picture of RS-4

Turnover:

Day shift normal working day.

C2A IA compressor is out of service for overhaul.

Currently under a severe thunderstorm warning for the next hour. All actions of 1203.025

Natural Emergencies are complete.

Swap ICW pumps to have P33A and P33B running to allow visual inspection of P33C. The Inside AO has been briefed and is standing by the ICW pumps. P33B had not been drained.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (SRO, BOP)	Swap operating ICW pumps
2	Lightning strike	N/A	Lightning strike
	DI-DG2S K01A3		#2 EDG auto start #2 EDG Auto Start Alarm
	CV-3807	C (SRO, BOP)	#2 EDG SW valve fails to open (TS) . #2 EDG Shutdown
3	N/A	N (SRO) R (ATC)	Dispatcher directs a power reduction to 700Mwe in the next 15 minutes.
4	Lightning strike	I (SRO, ATC)	Lightning strike
	ED451		Loss of the NNI Y power supply.
5	ED183	M (ALL)	Loss of Offsite Power/Degraded Power
6	DG175	C (SRO, BOP)	#1 EDG will not auto start (BOP-CT)
	DI_DG1_VR-LW		#1 EDG voltage low (<4100V)
7	FW621	C (SRO, ATC)	EFIC fails (ATC-CT) (TS)
8	DG173	M (ALL)	#1 EDG will trip (TS)
	A901	N/A	Alternate AC Generator available. (BOP-CT)
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

SCENARIO #2-R5 NARRATIVE

The crew will assume the watch at 100% power. C2A IA compressor is out of service for overhaul. It is a day shift normal working day. ANO is currently under a severe thunderstorm warning for the next hour. All actions of 1203.025 Natural Emergencies are complete.

The crew will start P33B and secure P33C per 1104.028 ICW Operating Procedure step 10.2 **(BOP-N) (SRO-N)**. This is being performed in order to visually inspect the motor rotor. P33B had not been drained.

A lightning strike will cause the auto start of the #2 EDG. The CRS should direct operations per 1203.012A Annunciator K01 Corrective Actions. The crew should determine it is a spurious actuation. The #2 EDG SW valve CV-3807 will not open resulting in no cooling flow to the EDG **(BOP-C) (SRO-C)**. The crew should take the #2 EDG to lockout to prevent an automatic trip of the EDG **(TS)**.

TS 3.8.1. Condition B

The dispatcher will call and direct U1 to reduce net generator output to 700Mwe **(SRO-N) (ATC-R)**.

A second lightning strike will result in the loss on NNI-Y power supply **(ATC-I) (SRO-I)**. The crew should recognize the loss of NNI-Y power. The CRS should implement 1203.047 Loss of NNI Power. The power supply breakers on RS-4 bkr 9 and Y01 bkr 39 will not reset. Breakers S-1 and S-2 on the NNI-Y power supply will not be tripped.

Letdown flow and pressure indication will be lost on C04. The letdown orifice bypass valve will fail to 50% reducing letdown flow. CFT pressure instrumentation will be lost along with NaOH tank temperature. All NNI-Y inputs to PMS/PDS will be lost or fail to mid scale.

A loss of offsite power will occur due to storm related grid instabilities **(SRO-M) (ATC-M) (BOP-M)**. The reactor will trip automatically. The CRS will direct operations per 1202.001 Rx Trip. After the immediate actions are complete the CRS will transition to either 1202.008 Blackout or 1202.007 Degraded Power depending on when the BOP manually starts the #1 EDG.

The #1 EDG will not auto start requiring the BOP to manually start the EDG **(BOP-C) (BOP-CT)**. The #1 EDG voltage will be <4100V requiring the BOP to raise EDG voltage.

CT criteria – The BOP should start the #1 EDG before the 15 minute criteria for declaring an SAE for a station blackout.

The EFIC system is failed and will not automatically actuate EFW on the Loss of Offsite Power **(ATC-C) (SRO-C)**. The ATC should manually actuate EFW from the remote switch matrix **(ATC-CT) (TS)**. The ATC will perform 1202.012 Repetitive Tasks RT-5 Verify proper EFW actuation and control. EFW may be manually actuated before the step in the EOP that directs verifying EFW actuated.

TS 3.3.11 Condition B

CT – EFW should be manually actuated before the ERV opens in automatic.

CONTINUED

SCENARIO #2-R5 NARRATIVE CONTINUED

The #1 EDG will trip putting the plant into a blackout **(SRO-M) (ATC-M) (BOP-M) (TS)**. The CRS will direct operations per 1202.008 Blackout.

TS 3.8.1 Condition E, 3.0.3

The alternate AC generator will become available. The BOP should energize the A3 bus from the AAC generator **(BOP-CT)**.

CT criteria – The AAC generator should be placed in service within 20 minutes of regaining the AAC Generator.

Facility: ANO-1

Scenario No.: 3-R5

Op-Test No.: 2008-1

Examiners: _____ Operators: _____

Initial Conditions:

100% power

C2A IA compressor is out of service for overhaul.

RPS is failed

RX trip P/B on C03 is failed

Turnover:

C2A IA compressor is out of service for overhaul.

Swap operating EH oil pumps following maintenance on the standby pump. The AO has been briefed and is standing by the EH pump.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (BOP, SRO)	Swap the operating EH oil pumps
2 & 3	FW086	C (SRO, BOP)	P8A heater drain pump winding failure and trip.
	N/A	N (SRO) R (ATC)	Power reduction
4	TR580	I (SRO, ATC, BOP)	Controlling Header Pressure fails low
5	CO_P14B CO_P14A DI_PB9201	C (BOP)	Operating EH pump will trip Turbine trip >43%
6	RP246,7,8,9	C (SRO, ATC)	RPS is failed (TS)
	DI_ICC0020	C (ATC) M (ALL)	C03 manual trip P/B failed (TS) Manual reactor trip (ATC-CT)
7 & 8	RC002	M (ALL)	~150 GPM tube leak in the 'B' SG (TS) (BOP-CT)
	N/A	N (ATC)	Plant cooldown and depressurization
9	IMF CV061	C (ALL)	Operating HPI pump trip

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

SCENARIO #3-R5 NARRATIVE

The crew will assume the watch with the plant at 100% power. C2A IA compressor is out of service for overhaul.

The turn over sheet will direct the crew to swap operating turbine electro-hydraulic pumps per 1106.012 Electro-Hydraulic Oil System Operation Section 14 **(SRO-N) (BOP-N)**.

P8A heater drain pump will experience a winding failure causing a high temperature alarm and P8A trip **(SRO-C) (BOP-C)**. The CRS should reference 1203.012E Annunciator Corrective Action P8A/P8B FLOW LO and CONDENSATE PUMP AUTOSTART.

A plant power reduction is required to maintain suction pressure. The CRS should direct the power reduction per 1203.045 Rapid Plant Shutdown **(ATC-R) (SRO-N)**.

The controlling Turbine Header Pressure instrument will fail low. **(SRO-C) (ATC-C) (BOP-C)** This will result in the turbine lowering demand to raise header pressure. The reactor and feedwater will rise as a result of the header pressure error. A SASS mismatch alarm will be received. The CRS will direct operations per 1203.012F Annunciator Corrective actions for SASS mismatch alarm and 1203.001 ICS Abnormal Operation. The crew should verify the turbine in manual control SG/RX master and both turbine bypass valves in manual. Once the plant is stable the crew will verify the alternate instrument is good and select the good it on C04. The crew should return ICS to automatic.

After the power reduction the operating EH oil will trip. The standby pump will not start **(BOP-C)**. The loss of both EH pumps will result in a turbine trip. (Crew may complete a manual RX trip prior to the turbine trip) The reactor will fail to trip do to a failure of RPS **(ATC-C) (TS)**. The manual RX trip pushbutton is failed **(ATC-C)**. The ATC should manually trip the reactor using the shunt trip breakers **(ATC-CT) (ATC-M) (BOP-M) (SRO-M)**.

TS 3.3.1 Condition C

TS 3.3.2 Condition A

CT criteria – The reactor should be manually tripped before the pressurizer goes solid.

A ~150gpm tube leak will occur in the 'B' SG **(ATC-M) (BOP-M) (SRO-M) (TS)**. The CRS should direct operation per 1202.006 Tube Rupture. The leak will be large enough to require HPI be initiated **(BOP-CT)**. An RCS depressurization and cooldown should be started **(ATC-N)**.

TS 3.4.13 Condition B

CT criteria – HPI should be initiated before SCM is lost.

The Operating HPI pump breaker trips due to a motor fault. **(SRO-C) (ATC-C) (BOP-C)** The CRS should direct operations per 1203.026 Loss of Reactor Coolant Makeup section 1 Loss of HPI Pump. The crew should diagnose the pump trip as a breaker fault and start the standby HPI pump. HPI should be restarted using the standby pump or raised using the ES pump. **(BOP-CT) (TS) (BOP-CT)**

TS 3.5.2 Condition A

CT criteria – HPI should be started or raised on the ES pump before SCM is lost.

The scenario may be terminated when HPI has been restarted or at the direction of the lead evaluator.